SAN CLEMENTE LOGGERHEAD SHRIKE: RECOVERY PLAN FOR AN ENDANGERED SPECIES

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ABSTRACT.—The San Clemente Loggerhead Shrike (*Lanius ludovicianus mearnsi*), listed as a federal and state endangered species and endemic to San Clemente Island (SCI) off the southern California coast, numbered only about 20 individuals in 1992. Consistently low abundance since the early 1980s has been attributed to loss of nesting habitat because of browsing by feral animals, aggravated by predation on eggs and young by native and exotic predators. To prevent extinction of the subspecies, a multifaceted recovery plan was initiated by the U.S. Navy that includes state, federal, and private cooperators. This paper describes the recovery plan, including: (1) removal of feral herbivores; (2) reduction of predators; (3) initiation of a captive flock; and (4) development of artificial reproductive enhancement, including double-clutching and hand-rearing and releasing of young. To date, shrike nesting habitat is recovering; predators have been reduced around nest sites; captive birds have bred; and wild, island birds have been induced to double clutch.

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The San Clemente Loggerhead Shrike (*Lanius ludovicianus mearnsi*), is endemic to San Clemente Island (145 km^2, 80 km off southern California). San Clemente Island (SCI), administered by the U.S. Department of the Navy, varies in width from 2.5–7.0 km and is 34 km long. A plateau extends along the center of SCI, reaching elevations of 600 m. The eastern slope drops precipitously to the ocean, whereas the western slope drops in a series of broad terraces. Deep canyons divide these slopes. Vegetation is a combination of scrub and grasslands. SCI has a mild maritime climate buffered by ocean temperatures and currents. Scott and Morrison (1990) detail the environment of SCI.

The San Clemente Loggerhead Shrike has the smallest range of any subspecies of Loggerhead Shrike (Miller 1931). Miller found that *L. l. mearnsi* was shorter in wing, tail, and bill measurements, and its underparts were lighter in color, than other California subspecies (see review in Scott and Morrison 1990). In 1977 the U.S. Fish and Wildlife Service listed *L. l. mearnsi* as an endangered species. Because of the paucity of data on the population, a series of population surveys and natural history studies were begun. These studies documented a breeding population density of only about five pairs in 1988, due primarily to predation by native and feral predators, and habitat degradation caused by exotic herbivores (Scott and Morrison 1990). Because of the low population density, a multifaceted recovery program was initiated in 1991 in an attempt to prevent extinction of the subspecies. In this paper we outline the general rationale and design of the program, and present preliminary results and recommendations.

Nesting habitat on SCI has been severely de-

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graded by feral goats first introduced to the island between 1849 and 1885. Goats caused the greatest amount of habitat damage during 1934–1976, when their population was not controlled. In 1976 the U.S. Navy began goat removal, and substantially reduced the population by the early 1980's. By 1991, virtually all goats had been removed. Vegetation is rapidly beginning to recover, even though the region has been experiencing drought conditions.

As summarized by Scott and Morrison (1990), shrikes on SCI have numerous predators: adults may be taken by native island foxes (*Urocyon littorals*), feral domestic cats (*Felis catus*), and various avian predators; and nestling and fledglings are taken by Common Ravens (*Corvus corax*), foxes, cats, and possibly rats (*Rattus* sp.). Fledglings are susceptible to predation during the first several weeks after leaving the nest because of their poor flying abilities. Scott and Morrison (1990) concluded that shrike productivity (1.3 ± 0.19 young/pair/year) was too low to maintain the population, and suggested that captive breeding or manipulation of eggs and young might be necessary to ensure long-term survival of *L. l. mearnsi*. The recent density estimates of adult *L. l. mearnsi* (Table 1) indicate the continuing inability of the population to increase beyond 20–25 birds.

Recovery Plan

In late 1990 and early 1991, several public and private organizations came together to develop an intensive recovery plan for *L. l. mearnsi*. The primary objective of this group was to prevent the extinction of the subspecies as predicted by Scott and Morrison (1990). The secondary objective was to enhance reproductive output on SCI through a series of related management activities. In summary, the recovery plan included; (1) development of a captive flock of *L. l. mearnsi*, (2) enhancement of production of young on SCI, and (3) reduction of predation at selected nests.

The goal of this plan was to at least double the breeding population in the wild within five years, concomitant with natural recovery of the vegetation resulting from goat removal. Based on previous work on other islands and preliminary trapping on SCI, it was assumed that cats, rats, ravens, and other predators could not be controlled throughout SCI. Rather, control efforts would be concentrated at specific nests based on logistic constraints. Below we briefly summarize procedures and initial results for each major phase of this project.

TABLE 1. Recent estimates of population abundance of wild, adult San Clemente Loggerhead Shrikes (Scott et al. unpubl. data).

Year	Total number of birds: Minimum	Total number of birds: Maximum
1984	19	28
1985	22	30
1986	22	24
1987	19	22
1988	13	17
1989	17	—[a]
1990	15	—[a]
1991	18	20
1992	22	24

[a] Not estimated because of insufficient sampling effort.

Captive Breeding and Enhancement of Productivity

Phase 1.—During 1991 10 shrike eggs and nestlings were removed from SCI and reared on the mainland at the San Diego Zoo. By late 1992, six of these birds were still alive (see below). Shrikes on SCI renested following removal of their initial clutch. The goal of this phase was to establish a viable breeding flock at the zoo.

Phase 2.—During 1992 the six surviving captive birds were paired and produced a total of seven chicks. These birds were retained in captivity. In addition, 20 eggs were retained in captivity. Another 20 eggs were taken from wild nests on SCI from four different pairs in 1992. These eggs were incubated on SCI with the intent of releasing the young directly on SCI after they attained well-developed flying ability. The rationale here was to sustain the birds through the high-predation, initial (10–14 days) fledgling period. Adults whose initial clutches were removed were allowed to renest and attempt to raise their own young.

Of the 20 eggs taken, 7 died during incubation due to an apparent bacterial infection (5 eggs) and incubator failure (2 eggs), and 5 hatchlings died from unknown causes. Of the 13 hatchlings, 8 were reared to independence and released onto SCI. Had all of the eggs taken into captivity survived, this alone could have doubled the wild population of shrikes in one year.

Young raised on SCI were moved to an outdoor release cage at approximately 40 days of age. They were maintained in the cage for about five days, at which time the cage was opened. Birds were provided supplemental food and their weights monitored remotely for 10–20 days, at which time feeding was discontinued to avoid further habituation of the birds to observers. All birds dispersed from the release site, except for one individual accidentally killed. Unfortunately, the U.S. Navy abruptly restricted our access to 1/3 of SCI, and this 1/3 supports 2/3 of the active nest sites. This administrative action precluded data collection that could confirm survivorship of fledglings. At this time we can confirm the presence of only two of the 1992 released birds. Our findings indicate, however, that shrikes can be raised in captivity to independence.

We concentrated predator control around shrike nesting areas and release site. Cats were trapped and euthanized; foxes were trapped and either released at the trap site or moved across island; and rats and ravens were poisoned. Foxes are generally not controlled because they are a native island endemic.

Predator control efforts during 1992 resulted in: 58 cats and 811 foxes in 3312 trap nights; 36 ravens in 209 trap days; and an unknown number of rats in 38 bait stations. Qualitative assessment of data indicates that cats could be temporarily trapped out of an area, but would quickly recolonize (based on fluctuation in trapping rate). Cat removal is complicated by foxes occupying traps more rapidly than cats, thus effectively reducing the number of traps open for cats to enter. Specific breeding pairs of ravens could be removed, but visual sightings indicate a large transient movement of ravens up and down canyons and trapping is relatively less effective for such birds. The effectiveness of rat bait stations is unknown since no individuals were found.

Conclusions

Initial results indicate that captive rearing of shrikes is possible, and that captive-reared birds will breed and produce eggs under captive conditions. Furthermore, captive-reared young can be successfully released into the wild. Overall population productivity can also be increased by removing eggs from wild pairs, and allowing the adults to raise a subsequent clutch. Long-term monitoring will be necessary to determine the ultimate fitness of captive-reared birds.

Results of predator control were equivocal, but may have dampened predation pressure in a few cases. The high incidence of nest failure in spite of current control efforts is troubling, and indicates that a more rigorous evaluation of predation and predator control is warranted.

The multifaceted program of natural history monitoring, captive rearing, and predator control shows promise. The techniques being pioneered by this program will have direct application to other species of altricial birds. It is essential, however, that monitoring the survival and breeding behavior of captive-reared birds be continued. Furthermore, intensive research on specific causes and rates of predation should be conducted.